of the Universities, a representative selected by the Incorporated Association of Headmasters, another selected by the Headmasters' Conference, another by the Royal Society, and two members nominated by the Secretary of State. The settlement of the syllabus of examination will be left in their hands. There is to be one and the same examination for Woolwich and Sandhurst for the Army and for the Militia. For University candidates, whom Mr. Brodrick is anxious to encourage, a scheme has been prepared which will enable them to enter the Army on equal terms with other candidates. A student will have to pass Moderations at Oxford or some equivalent examination at another University before he is twenty, and he will also have to do six weeks' training with a Regular unit at Aldershot or elsewhere. He will then be given a provisional commission. Before he is twenty-two he will have to take honours at the University and to go through another six weeks' training. He will then receive a commission dating back two years. The Universities are to be asked to include in their honours examination two or three military subjects—*e.g.* military topography and military history.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, January 22.—"Characteristics of Electric Earth-current Disturbances and their Origin." By J. E. **Taylor.** Communicated by Sir Oliver Lodge, F.R.S.

The paper deals with disturbing effects, produced by rapidly varying earth-currents, on a telephone receiver, connected in a short line of telegraph having both ends earthed in the sea. The sounds produced have certain well-marked characteristics. In these latitudes they are always stronger and of more frequent occurrence in summer than in winter. They are daily in evidence for a few hours at, or about, the time of sunset, *i.e.* whilst daylight is fading. In general they do not evidence themselves to any great extent during broad daylight, but are readily precipitated by a state of electrical tension in the atmosphere which may culminate in a thunderstorm, and rarely fail to herald the approach of a storm or gale.

Particularly noticeable among the various types of disturbance enumerated, there are some which resemble the distant scream of a rocket rising in the air. These commence with a shrill whistle, and die away in a note of diminishing pitch. They vary in intensity, but always have a similar duration of from two to four seconds, are freely heard at night, and only occasionally during the day. The sound is characteristic of an initial high velocity rapidly damped and dissipated. This type of disturbance is assumed to be produced by the passage of meteoric bodies in sufficient proximity to the circuit, which set up rapidly intermittent electrical discharges in the upper regions of the atmosphere, inducing electric currents in the sea which affect the circuit. That they are only occasionally heard during broad daylight is explained by the ionisation of the upper atmosphere by solar radiations, possibly electronic, which interposes a conducting screen. A high state of electrical tension in the atmosphere nullifies or modifies the conductivity produced. At nightfall solar radiations cease to act, and conductivity disappears gradually. The nightfall disturbances are accounted for by aërial electric currents associated with the disappearance of ionic conductivity, the effects of these aerial currents becoming perceptible so soon as the conductivity becomes sufficiently small to act no longer as a screen. It is suggested that similar causes influence the diurnal variations of the earth's magnetic field, and that the changes of ionisation of the atmosphere offer a reasonable explanation of the greater night-time efficiency in signalling recently observed by Mr. Marconi in experiments with Hertzian wireless telegraphy.

"Some Dielectric Properties of Solid Glycerine." By Ernest **Wilson**, Professor of Electrical Engineering, King's College, London. Communicated by Sir William Preece, K.C.B., F.R.S.

February 12.—"The Brain of the Archæoceti." By Dr. G. Elliot **Smith.** Communicated by Prof. G. B. Howes, F.R.S.

"Primitive Knot and Early Gastrulation Cavity Coexisting with Independent Primitive Streak in Ornithorhynchus." By Prof. J. T. **Wilson** and Dr. J. P. **Hill.** Communicated by Prof. G. B. Howes, F.R.S.

Linnean Society, February 19.—Prof S. H. Vines, F.R.S., president, in the chair.—Mr. John **Clayton,** of Bradford, presented a set of thirty-two photographs to illustrate the celebrated Cowthorpe Oak, near Wetherby, Yorkshire. The author concludes that the age of the tree has been greatly over-estimated, his own belief being that 500 years is the extreme limit of its age, from sapling to its present decrepitude and decay.—Dr. George **Henderson** offered some remarks on the possible uses of essential oils in the economy of plant-life. Adverting to the well-known fact that moisture in the air prevents radiation and consequent loss of heat, he suggested that emanations of essential oil from plants might possibly prevent damage by night frost during the period of flowering, basing his suggestion on Prof. Tyndall's researches thirty-two years since, on the presence of infinitesimal quantities of essential oil in the air. Tyndall found such presence increased the absorptive power of the air as regards heat-rays: taking dry air as 1, air saturated with moisture as 72, then traces of essential oil rank as follows:—Rosemary 74, cassia 109, spikenard 355 and aniseed 372. Dr. Henderson brought these remarks before the meeting as an interesting question for botanic investigation, since essential oils are usually regarded as mere waste products.—The Rev. T. R. R. Stebbing, vice-president, having taken the chair, the first paper, on the electric pulsation accompanying automatic movements in *Desmodium gyrans,* by Prof. J. C. **Bose,** was summarised by the president for the author. In this paper Prof. Bose gives the results of his investigation of the question as to whether or not spontaneous movements are accompanied by an electric disturbance comparable to that resulting from external stimulation. Spontaneous movements are not uncommon in the higher plants, but for various reasons there are but few instances suitable for an investigation of this kind. The most striking case is that of *Desmodium gyrans,* the telegraph-plant. The leaf of this plant is trifoliolate, consisting of two small lateral leaflets and a larger terminal leaflet. The lateral leaflets move up and down, like the arms of a semaphore—whence the popular name of the plant—the period of a complete up and down movement, in the plants observed, being about 3½ minutes. Having placed one electrode on the petiolule of a leaflet and the other on the petiole of the leaf, both in connection with a galvanometer, Prof. Bose found that the spontaneous movement is associated with an electrical disturbance of a peculiar kind. There is first a large principal wave of disturbance, followed by a smaller subsidiary wave, the period of the former being about 1 minute, that of the latter about 2½ minutes. This disturbance is the expression of a "current of action" travelling in the plant from the excitable petiolule to the resting petiole.—A paper by Miss A. L. **Embleton,** communicated by Prof. G. B. Howes, was read by Mr. A. D. Michael for the author, on *Cerataphis Lataniae,* a peculiar Aphid. This insect was observed in 1901 on various orchids in the Cambridge University Botanic Garden. The author gives the detailed synonymy of the creature, which is well known to cultivators on the Continent, and proceeds to set out its life-history; in this country it exists in only one form, reproduced parthenogenetically, corresponding to an aleurodiform stage of a migratory Aphis. The author concludes by suggesting that it is one of the migratory Aphides which has been deprived of its usual series of metamorphoses owing to an artificial mode of life.—On specialisation of parasitism in the Erysiphaceæ, by Mr. E. S. **Salmon.** The author began by explaining the term "biologic form" or "species" by instancing two fungi which were not distinguishable morphologically, acting in diverse fashion on the same host-plants. This phenomenon has been known in the Uredineæ for some time, but its discovery in the Erysiphaceæ was more recent.

Royal Microscopical Society, February 18.—Dr. Henry Woodward, F.R.S., president, in the chair.—Dr. Arthur **Rowe** gave a demonstration on the photomicrography of opaque objects as applied to the delineation of the minute structure of chalk fossils. Dr. Rowe said the photomicro-

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graphy of opaque objects was not so easy as that of transparent objects, for though the broad principles seemed very simple, there were difficulties quite unknown to those who only photographed transparent objects. He used a long camera with powers from 6″ up to 1½″, and had found the incandescent gas light was the best light for the purpose. Success entirely hinged upon obtaining a good contrast of light and shade, and in addition to the difficulties in connection therewith, a great obstacle arose from the inequality of the surfaces of many objects, which rendered focusing troublesome.

EDINBURGH.

Royal Society, February 2.—Prof. James Geikie, F.R.S., in the chair.—The meeting was devoted to papers giving some of the preliminary results obtained last season during the bathymetrical survey of the Scottish fresh-water lakes under the direction of Sir John Murray, K.C.B., F.R.S.—Dr. T. N. **Johnston** gave an account of Loch Morar and the neighbouring lochs Beoraid and Nostarie, which drain into it, showing that Loch Morar, with a maximum depth of 1009 feet, is the deepest known British lake. There are seven European lakes known to be deeper, but only three of these exceed it in depth below sea-level. At the time of surveying, the surface of Loch Morar was found to be 30·5 feet above sea-level, and its mean depth is calculated at 284 feet. Loch Beoraid has a maximum depth of 159 feet, and its surface was found to be 170 feet above sea-level. Loch Nostarie, with a maximum depth of 35 feet, is a shallow loch lying in the drift at a height of 89·3 feet above sea-level.—Mr. T. R. H. **Garrett** read a paper on the temperatures in Lochs Morar, Eilt and Dubh (Ailort). The depth of Eilt is 119 feet, and that of Dubh is 153 feet, whilst their heights above sea-level are 96 feet and 103 feet respectively. The temperature in the western portion of Eilt was higher at all depths than in the central, and higher in the central than in the eastern; this was attributed to the north-east winds of the previous week. The temperature in Loch Dubh on July 12, 1902, was 59°·0 at the surface and 43°·5 at the bottom, which is the greatest range observed on any one day in any Scottish loch during last year. This was attributed to the small area of the loch compared with its depth, and to its extremely small drainage area. He placed the limit of penetration of heat due to solar radiation in Loch Morar at 800 feet, and compared this limit with that of 300 to 450 feet in Lake Geneva as given by Forel.—Mr. James **Murray** read a paper on the pelagic life in the lochs, and gave a summary of the biological work done during the season. Most of the Entomostraca and Rotifera, and all the lower forms, were found to be very uniformly distributed. In the Calanidæ two species of Diaptomus, viz. *D. Wierzyskii* and *D. laciniatus*, were shown to be generally distributed in the north. In the large and deep lochs such as Morar and Tay, only a few species of almost cosmopolitan distribution constitute the fauna of the open water. In smaller lochs life is much more abundant. The total absence of Daphnia from Loch Morar and some other lochs might suggest an investigation into the composition of the water and other conditions of these lochs. In regard to the vertical migration of pelagic animals, it was found on one occasion in Loch Treig that the Copepoda were abundant at a depth of from 40 to 90 feet, but scarce nearer the surface. Some curiosities of distribution were given, such as the occurrence of great numbers of the empty cases of Clathrulina in several large lochs, although the animal was never found alive in any loch.

PARIS.

Academy of Sciences, March 2.—M. Albert Gaudry in the chair.—The storm of March 2, 1903, by M. **Mascart.** Mention is made of the usefulness of the meteorological station at the Azores. The barometer stood at 7 p.m. at 775 mm. at Horta, in the Azores, whilst in the north of Ireland at the same time it was 725 mm., a gradient of 50 mm. between the two stations, an altogether exceptional value, and which fully explains the violence of the storm.—On the absorption of light (1) by a body naturally heterotropic and on which an intense magnetic field has impressed a strong rotatory power, and (2) by an isotropic body, which such a field renders both birefringent and asymmetric, by M. J. **Boussinesq.**—The preparation and properties of two tetra-alkyl-diamido-diphenylanthrones, by MM. A. **Haller** and A. **Guyot.** The tetramethyl-diamido-diphenylanthrone is obtained in good yield by the condensation of the chloride of anthraquinone with dimethyl-aniline in carbon bisulphide solution in presence of aluminium chloride. The corresponding ethyl compound is obtained in a similar manner, diethyl-aniline being substituted for the dimethyl-aniline. Both compounds react with dilute mineral acids to form colourless salts.—On the generalisation of the Laplace-Abel integral, by M. G. **Mittag-Leffler.**—The discovery of fishes in the Devonian layer of the Pas-du-Calais, by M. J. **Gosselet.** The fossils found were of the genus Pteraspis, which is very common in the Old Red Sandstone in England and Scotland, but which has not been previously found in the Ardennes or in the eastern prolongations.—Remarks by M. C. de **Freycinet** on the experimental teaching of geometry.—Observations on the comet 1902 *b*, made with the 33 cm. equatorial of the Observatory of Lyons, by MM. J. **Guillaume** and G. le **Cadet.** The comet had the aspect of a very feeble nebulosity, which sometimes appeared to show a faint condensation. It was at the limit of visibility with the magnification of 150 employed for the measurements.—Perturbations which do not depend on the elongation, by M. Jean **Mascart.**—On slipping in fluids: a correction of a preceding note, by M. **Hadamard.**—Remarks on the liquidogenic theories of fluids, by M. E. **Mathias.** Of the two views of the phenomena at the critical point, the one regards the saturated state as univariant, the temperature determining the pressure as well as the density of the saturated fluid. This leaves certain facts unexplained, such as the anomalies between the densities of the liquid and saturated vapour in Natterer's tubes, the disappearance of the meniscus below the critical temperature, and the possible heterogeneity of the fluid above the critical point. These phenomena are explained by the theory of De Heen. The author shows that these two theories are not necessarily incompatible.—New researches on electric convection, by MM. H. **Pender** and V. **Cremieu.** The authors, working independently, have previously arrived at contradictory results on the magnetic effect of electric convection, and hence have decided to pursue the subject in collaboration. So far the experiments have given indecisive results, the effects being very irregular.—On the heat of combustion of phosphorus and on the phosphoric anhydrides, by M. H. **Giran.** The heat of combustion of yellow phosphorus has been determined by burning with compressed oxygen in the Mahler bomb, the results being about 3 per cent. higher than those currently accepted. From the heat of solution of the pentoxide obtained, it would appear to consist of the amorphous variety. Metaphosphoric acid is the only product on solution in water.—On some new acetylenic acids, by MM. Ch. **Moureu** and R. **Delange.** By acting upon acetylenes of the general formula R—C≡C—H with sodium and then treating these with CO_2, the authors have prepared a number of acetylene acids of the fatty series, the more important physical properties of which are given.—Contribution to the study of the thio-acids of the formula R—CO—SH, by MM. V. **Auger** and M. **Billy.** The only method allowing of the production of true thio-acids is that of Kékulé, the saponification of esters with sodium hydrosulphide.—On para-ethyl-benzoic aldehyde, by M. H. **Fournier.** An unsuccessful attempt was made to prepare this aldehyde by the action of hydrogen chloride and carbon monoxide on ethyl-benzene in presence of aluminium chloride. It was obtained by Bouveault's method by the action of ethoxalyl chloride upon ethyl-benzene in presence of aluminium chloride, heating the resulting ester with aniline, and boiling the derivative obtained with dilute sulphuric acid.—A method for estimating glycerol in the blood, by M. Maurice **Nicloux.** After precipitating and separating the albuminoid matters of the blood, the glycerol is distilled in a vacuum at 100° C., and estimated by potassium bichromate and sulphuric acid. A series of test analyses is given, the mean error being about .5 per cent., or approximately that inherent in the bichromate method.—On the structure of the tracheal cell of the gad-fly, and on the origin of the ergastoplasmic formations, by MM. A. **Conte** and C. **Vaney.**—The manometric ear, by M. Pierre **Bonnier.** A criticism of the results of experiments recently published by M. Marage.—The nervous ganglia of the posterior roots belonging to the system of the great sympathetic, by M. N. Alberto **Barbieri.**

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—The dinosaurs of Belgium, by M. Louis **Dollo.**—A biological study of parasitism; *Ustilago Maydis*, by M. Julien **Ray.**—On the geology of the Montagne des Français (Madagascar), by M. Paul **Lemoine.**—On subterranean waters and the disappearance of springs, by M. E. A. **Martel.**—On geographical explorations carried out in the Tchad region, by M. **Destenave.**

DIARY OF SOCIETIES.

THURSDAY, MARCH 12.

ROYAL SOCIETY, at 4.30.—On the Histology of *Uredo dispersa*, Erikks., and the "*Mycoplasm*" Hypothesis: Prof. Marshall Ward, F.R.S.—The Statolith Theory of Geotropism: F. Darwin, F.R.S.—A Study of a Unicellular Green Alga, occurring in Polluted Water, with Especial Reference to its Nitrogenous Metabolism: Miss H. Chick.—A Comparative Study of the Grey and White Matter of the Motor Cell Groups and of the Spinal Accessory Nerve in the Spinal Cord of the Porpoise (*Phocaena communis*): Dr. D. Hepburn and Dr. D. Waterston.—The Oestrous Cycle and the Formation of the Corpus Luteum in the Sheep: F. H. A. Marshall.—On the Culture of the Nitroso-bacterium: H. S. Fremlin.—Upon the Immunising Effects of the Intracellular Contents of the Typhoid Bacillus as Obtained by the Disintegration of the Organism at the Temperature of Liquid Air: Dr. A. Macfadyen.

ROYAL INSTITUTION, at 5.—Insect Contrivances: Prof. L. C. Miall, F.R.S.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Distribution Losses in Electric Supply Systems: A. D. Constable and E. Fawssett.—A Study of the Phenomenon of Resonance in Electric Circuits by the Aid of Oscillograms (abstract): M. B. Field.

SOCIETY OF ARTS, at 4.30.—The Currency Policy of India: J. Barr Robertson.

MATHEMATICAL SOCIETY, at 5.30.—On the Convergence of Certain Multiple Series: G. H. Hardy.—On the Representation of a Group of Finite Order as an Irreducible Group of Linear Substitutions and the Direct Establishment of the Relations between the Group-Characteristics: Prof. W. Burnside.—Approximate Calculation of the Periods of Vibration of a Circular Plate: Prof. H. Lamb.—Mathematical Notes: Dr. H. F. Baker.—Note on a Point in Hilbert's Grundlagen der Geometrie: F. T. Dixon.—On Surfaces which have Assigned Families of Curves as their Lines of Curvature: Prof. A. R. Forsyth.—Extension of Two Theorems on Covariants: J. H. Grace.—On Certain Sequences for Determining the nth Root of a Rational Number: S. M. Jacob.

FRIDAY, MARCH 13.

ROYAL INSTITUTION, at 9.—Character Reading from External Signs: Prof. Karl Pearson, F.R.S.

PHYSICAL SOCIETY, at 5.—On the Interpretation of Milne Seismograms: Dr. Farr.—A Potentiometer for Thermocouple Measurements: Dr. R. A. Lehfeldt.—A Direct-Reading Potentiometer for Thermoelectric Work: Dr. J. A. Harker.—The Measurement of Small Resistances: A. Campbell.—A Resistance Comparator: Dr. R. A. Lehfeldt.

MALACOLOGICAL SOCIETY, at 8.—Further Description of the Animal of *Damayantia carinata*, Collinge: Lieut.-Col. H. H. Godwin-Austen, F.R.S.—Note on the Generic Name Buliminus: B. B. Woodward.—Notes on Pleistocene Non-marine Mollusca from Portland Bill; and on Holocene Non-marine Mollusca from Wilts, Dorset, Cambridgeshire and Folkestone: R. Ashington Bullen.—On the Occurrence of *Neritina Grateloupiana*, Fér., in the Pleistocene at Swanscomb: A. S. Kennard and B. B. Woodward.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Reconstruction of Midland Railway Bridge No. 27, over the River Trent: A. R. Langton.

ROYAL ASTRONOMICAL SOCIETY, at 5.—On the Desirability of a Re-investigation of Problems growing out of the Mean Motion of the Moon: Prof. S. Newcomb.—A Proposed Southern Belt of Latitude Stations: Prof. S. C. Chandler.—On three of Sir W. Herschel's Observed Nebulous Regions in Orion: Prof. Max Wolf.—On the Period and Light Curve of 7514 *UV* Cygni: A. Stanley Williams.—On the Nebula *h* 2302 Cassiopeiæ; the Region surrounding H II. 457 Eridani and H III. 558 Aquarii: Dr. Isaac Roberts.—A Series of Photographs of Nebulæ, &c., taken by Mr. Ritchey at the Yerkes Observatory will be Exhibited.

SATURDAY, MARCH 14.

ROYAL INSTITUTION, at 3.—Light: Its Origin and Nature: Lord Rayleigh.

MONDAY, MARCH 16.

SOCIETY OF ARTS, at 8.—Hertzian Wave Telegraphy in Theory and Practice: Prof. J. A. Fleming, F.R.S.

SOCIETY OF CHEMICAL INDUSTRY, at 8.—The Standardisation of Analytical Methods: H. Droop Richmond.—The Standardisation of Commercial Methods of Analysis, especially those applied to Brewing Materials: Arthur R. Ling.

TUESDAY, MARCH 17.

ROYAL INSTITUTION, at 5.—Great Problems in Astronomy: Sir Robert Ball.

ZOOLOGICAL SOCIETY, at 8.30.—Observations and Experiments on Japanese Long-Tailed Fowls: J. T. Cunningham.—On some Nudibranchs from East Africa and Zanzibar. No. II: Sir Charles Eliot, K.C.M.G.—Contributions to the Osteology of Birds. Part VI. *Cuculiformes*: W. P. Pycraft.

SOCIETY OF ARTS, at 4.30.—Artistic Fans: Miss Hannah Falcke.

ROYAL STATISTICAL SOCIETY, at 5.—Statistics of Italy: Bolton King.

INSTITUTION OF CIVIL ENGINEERS, at 8.—*Papers to be further discussed*:—Recent Irrigation in the Punjab: S. Preston.—The Irrigation Weir across the Bhadar River, Kathiawar: J. J. B. Benson.—*Paper to be read, time permitting*:—The Protection Works of the Kaiser-i-Hind Bridge over the River Sutlej, near Ferozepur: Amyas Morse.

WEDNESDAY, MARCH 18.

ROYAL MICROSCOPICAL SOCIETY, at 8.—The Helmholtz Theory of the Microscope: J. W. Gordon.

SOCIETY OF ARTS, at 8.—New Aspects of Life Assurance: William Schooling.

CHEMICAL SOCIETY, at 5.30.—(1) Essential Oil of Hops: (2) On a Compound of Dextrose with Hydroxide of Aluminium: A. C. Chapman.—Action of Phosphorus Haloids on Dihydroresorcins. Part II. Dihydroresorcin: A. W. Crossley, and P. Haas.—On the Constitution of Cotarnine: J. J. Dobbie, A. Lauder, and C. K. Tinkler.—Decomposition of Mercurous Nitrite by Heat: P. C. Ray and J. N. Seh.

ENTOMOLOGICAL SOCIETY, at 8.—An Entomological Excursion to Bejar, Central Spain: G. C. Champion.—On Lepidoptera from the White Nile collected by Mr. W. L. S. Loat, with further Notes on Seasonal Dimorphism in Butterflies: Dr. Frederick A. Dixey.—*Hymenoptera aculeata* collected by the Rev. A. E. Eaton, in Madeira and Tenerife, in the Spring of 1902: E. Saunders, F.R.S.

ROYAL METEOROLOGICAL SOCIETY, at 7.30.—The Passage of Sound through the Atmosphere: C. V. Boys, F.R.S.

THURSDAY, MARCH 19.

ROYAL SOCIETY, at 4.30.—*Probable Papers*:—On the Formation of Barrier Reefs and of the Different Types of Atolls: Prof. A. Agassiz, For. Mem. R.S.—On Central American Earthquakes, particularly the Earthquake of 1838: Admiral Sir John Dalrymple Hay, Bart, F.R.S.—On the Electrons of Radium: Sir William Crookes, F.R.S.

LINNEAN SOCIETY, at 8.—On *Poa laxa* and *Poa stricta*, of our British Floras: G. Claridge Druce.—The Botany of the Ceylon Patanas. Part II. Anatomy of the Leaves: John Parkin and H. H. W. Pearson.

FRIDAY, MARCH 20.

ROYAL INSTITUTION, at 9.—The Paths of Volition: Prof. E. A. Schäfer, F.R.S.

EPIDEMIOLOGICAL SOCIETY, at 8.30.—The Prevention of Diphtheria Outbreaks in Hospitals for Children: Dr. Louis Parkes.

INSTITUTION OF MECHANICAL ENGINEERS, at 8.—A Premium System applied to Engineering Workshops: James Rowan.

SATURDAY, MARCH 21.

ROYAL INSTITUTION, at 3.—Light: Its Origin and Nature: Lord Rayleigh.

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